Testing Choice Theory Using Discrete Choice Experiments in Swiss Energy Policy

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Summary

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The "Swiss Energy Strategy 2050" proposes to phase-out nuclear power generation and expand renewable sources of energy. Hydropower, an established source of energy in Switzerland, is expected to be one of the key renewables that will be further expanded. In this policy context, this PhD thesis aims to test axioms and assumptions underlying microeconomic choice theory by applying discrete choice experiments (DCE). A DCE is conducted among a representative sample of Swiss respondents and elicits their preferences for an expansion of hydropower. This dissertation contributes to the existing literature by examining how public preferences for expanding hydropower production are linked to public perception of (avoiding) nuclear risks. To this end, hydropower as well as nuclear risks are included in the DCE.

This thesis begins with a quantitative meta-analysis of the existing stated preference literature that estimates the non-market values of hydropower externalities. The results of the meta-analysis are used as inputs in designing the DCE. The results of the meta-analysis suggest that deteriorations in vegetation, landscape, and wildlife are valued negatively, while there is only limited evidence for a significant positive willingness-to-pay (WTP) for mitigating these negative externalities. The avoidance of greenhouse gas emissions proves to exert a significant positive influence on welfare estimates, but no significant impacts on aesthetic and recreational amenities can be detected. The meta-analysis also reveals that no stated preference studies so far have considered the link between preferences for renewable sources of energy and nuclear risks.

The data obtained from the DCE are used to answer this dissertation's main research questions. These focus on the standard choice-theory assumptions of

certain and known preferences and the axioms of continuity and monotonicity. Furthermore, the role of multiple reference points in the framework of prospect theory is investigated.

More specifically, the common and idiosyncratic determinants of choice certainty, consistency, and monotonicity are investigated. In contrast to the existing literature, these three concepts are analyzed simultaneously based on the same sample of respondents. The results show that there are significant differences between the choice behavior of certain and uncertain respondents as well as between consistent and inconsistent respondents. Moreover, gender and choice-task complexity prove to be common predictors of choice certainty, consistency, and monotonicity.

This thesis also investigates the standard economic axiom of continuous preferences in the context of attribute-non-attendance (ANA). A novel methodology to assess ANA is presented based on the monitoring of the respondents' visual information acquisition process using mouse-tracking. No significant model improvement is found when including such a visual measure of ANA compared with the standard approach based on stated ANA information. Nevertheless, choice models based on visual ANA result in a slight improvement over choice models that do not take ANA into account and over choice models that use inferred ANA information.

Finally, the dependence of preferences on (multiple) reference points, a key assumption in prospect theory, is tested. Non-status quo related reference points, associated with comparative risks shown on risk ladders, are expected to affect parameter estimates and welfare measures for a change in hydropower and nuclear risk. The study confirms the importance of multiple reference points, and shows that, besides the status quo, these other reference points also influence respondents' choices and welfare measures in DCEs.

The results of this thesis support the need for a holistic view on energy policy accounting for the direct and indirect externalities of alternative energy sources in both research and policy.